# UNITED STATES PATENT OFFICE.

JOSEPH A. WILLIAMS, OF CLEVELAND, OHIO.

## IGNITION APPARATUS.

1,092,417. Specification of Letters Patent. Patented Apr. 7, 1914.

Application filed March 5, 1913. Serial No. 752,147.

*To all whom it may concern:*

Be it known that I, JOSEPH A. WILLIAMS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Ignition Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to ignition apparatus for internal combustion engines, and particularly to the induction coil and its adjuncts by means of which such ignition is most usually effected, it being understood that the induction coil referred to is one of the "jump spark" type; as contradistinguished from the "wipe spark" type.

The high speed at which internal combustion engines are frequently operated at the present day necessitates the very accurate timing of the electric spark in order to effect the explosion of the mixture at the most opportune instant, while on the other hand, the magnetic and mechanical lag of the ignition devices, particularly the induction coil, causes the spark to take place an appreciable time after the making of contact by the engine-driven timer. It is customary in the case of multicylinder engines to employ a separate coil for each cylinder, wherefore the lag of all the coils ought to be very accurately equal so that the charges in the different cylinders shall be exploded at proper times as regards the positions of their pistons. The difference in the lag of different coils as hitherto made, while very small in actual amount, is sufficient to cause serious irregularity in the operation of the engine. Accordingly, it is customary for the manufacturers of ignition apparatus to adjust their coils very accurately so that the spark shall take place at the same phase instant in all cylinders, delicate and refined measuring apparatus being employed for the purpose. Unfortunately, however, the lag of the coils has also depended largely upon the adjustment of the back-contact-point so that any change in the position of the usual adjusting screw in an effort to obtain a "fatter" or "thinner" spark changes the relation of spark and piston. This adjusting screw is, for some reason, one of the first things which is resorted to when, for any reason, the engine fails to operate properly, and thus the manufacturer's careful work may be entirely lost. Finally, of course, if after this mal-adjustment the ignition apparatus should fail to operate properly, the owner would blame the ignition people rather than his own meddling, thereby bringing the manufacturers into disrepute.

Accordingly, the object of the present invention is the provision of an ignition coil for internal combustion engines having a new, improved, and simplified vibrator construction; the provision of a device of this character in which the strength of the magnetic field in which the vibrative reed or tongue is located shall always be substantially proportioned to the tension upon such reed or tongue throughout the entire range of its movement; the provision of an ignition coil for internal combustion engines or the like wherein the lag may easily be adjusted by any man knowing the proper method and possessing the requisite tools, but without the probability of being tampered with by unskilled persons; the provision of a device of this character wherein the important adjustment devices shall be so hidden and concealed as largely to escape attention and, if discovered, to be very difficult of access; the provision of a device of this character of greater simplicity and fewer number of parts than devices of the same type hitherto employed; while further objects and advantages of the invention will become apparent as the description proceeds.

Generally speaking, my invention may be defined as consisting of the combinations of parts recited in the claims hereto annexed and illustrated in the drawings accompanying and forming part of this application, wherein:

Figure 1 is a longitudinal cross-sectional view through an induction coil equipped with my improvements; Fig. 2 is a plan view of the vibrator; Fig. 3 is a detail cross sectional view taken upon the line 3—3 of Fig. 2; Fig. 4 is a perspective view of the cover of the coil; Fig. 5 is a perspective view of the adjustable vibrator support; Fig. 6 is a longitudinal cross sectional view of the support illustrating the adjusting means; Fig. 7 is a perspective view of the vibrating tongue or reed; Fig. 8 is a map of the magnetic field hitherto customarily employed showing the relation of the reed thereto; and Fig. 9 is a similar map of the field employed with my improved device and its relation to the reed.

Describing the parts by reference charac-